WHAT IS CLAIMED IS:

1. A method of fabricating a single crystal thin film, comprising the steps of:

forming a non-single crystal thin film on an insulating base;

subjecting the non-single crystal thin film to a first heat-treatment, thereby forming a polycrystalline thin film in which polycrystalline grains are aligned in an approximately regular pattern; and

subjecting the polycrystalline thin film to a second heat-treatment, thereby forming a single crystal thin film in which the polycrystalline grains are bonded to each other.

2. A method of fabricating a single crystal thin film according to claim 1, wherein at least either said first heat-treatment and said second heat-treatment is performed by irradiation of laser beams.

3. A method of fabricating a single crystal thin film according to claim 1, wherein said first and second heat-treatments are performed by irradiation of laser beams, and an intensity of the laser beam at said second heat-treatment is lower than an intensity of the laser beam at said first heat-treatment.

4. A method of fabricating a single crystal thin

film according tc claim 1, wherein said second heat-treatment is performed at a temperature lower than a melting point of the polycrystalline thin film.

5. A method of fabricating a single crystal thin film according to claim 1, wherein at least either said first heat-treatment or said second heat-treatment is performed by irradiation of laser beams emitted from an excimer laser.

6. A method of fabricating a single crystal thin film according to claim 1, wherein at least either said first heat-treatment or said second heat-treatment is performed by irradiation of line beam laser.

7. A method of fabricating a single crystal thin film according to claim 6, wherein said irradiation of line beam laser is performed by overlapping the laser beams in a scanning direction perpendicular to a longitudinal direction of the irradiation of line beam laser.

8. A method of fabricating a single crystal thin film according to claim 1, wherein at least either said first heat-treatment or said second heat-treatment is performed by irradiation of rectangular beam laser.

9. A method of fabricating a single crystal thin film according to claim 8, wherein said irradiation of

rectangular beam laser is performed by using a mask.

10. A method of fabricating a single crystal thin film according to claim 1, wherein said second heat-treatment is furnace anneal, lamp anneal, or strip heater anneal.

11. A method of fabricating a single crystal thin film according to claim 1, wherein at least either said first heat-treatment or said second heat-treatment is performed substantially in a vacuum, an inert gas atmosphere, or a non-oxidizing gas atmosphere.

12. A method of fabricating a single crystal thin film, comprising the steps of:

forming a non-single crystal thin film on an insulating base; and

irradiating the non-single crystal thin film with laser beams, thereby converting the non-single crystal thin film into a single crystal thin film.

13. A method of fabricating a single crystal thin film according to claim 12, wherein the laser beams are excimer laser beams.

14. A method of fabricating a single crystal thin film according to claim 12, wherein said laser irradiation is performed in two steps: first laser irradiation and second laser irradiation.

15. A method of fabricating a single crystal thin film according to claim 14, wherein an energy density of said second laser irradiation is lower than an energy density of said first laser irradiation.

16. A method of fabricating a single crystal thin film according to claim 14, wherein a temperature of an area irradiated by said second laser irradiation is lower than a melting point of the non-single crystal thin film.

17. A method of fabricating a single crystal thin film according to claim 14, wherein at least either said first laser irradiation or said second laser irradiation is irradiation of line beam laser.

18. A method of fabricating a single crystal thin film according to claim 17, wherein said irradiation of line beam laser is performed by overlapping the laser beams in a scanning direction perpendicular to a longitudinal direction of the irradiation of line beam laser.

19. A method of fabricating a single crystal thin film according to claim 14, wherein at least either said first laser irradiation or said second laser irradiation is performed by irradiation of rectangular beam laser.

20. A method of fabricating a single crystal thin film according to claim 19, wherein said irradiation of

rectangular beam laser is performed by using a mask.

21. A method of fabricating a single crystal thin film according to claim 12, wherein said laser irradiation is substantially performed in a vacuum, an inert gas atmosphere, or a non-oxidizing gas atmosphere.

22. A method of fabricating a single crystal thin film according to claim 12, wherein said laser irradiation is followed by a heat-treatment.

23. A method of fabricating a single crystal thin film according to claim 22, wherein said heat-treatment is furnace anneal, lamp anneal, or strip heater anneal.

24. A method of fabricating a single crystal thin film according to claim 22, wherein said laser irradiation and said heat-treatment are substantially performed in a vacuum, an inert gas atmosphere, or a non-oxidizing gas atmosphere.

25. A method of fabricating a single crystal thin film, comprising the steps of:

forming a non-single crystal thin film on an insulating base;

subjecting the non-single crystal thin film to a first heat-treatment, to introduce a common boundary condition, thereby forming a polycrystalline thin film; and

subjecting the polycrystalline thin film to a second heat-treatment, thereby forming a single crystal thin film in which polycrystalline grains are crystallized.

26. A method of fabricating a single crystal thin film according to claim 25, wherein at least either said first heat-treatment and said second heat-treatment is performed by irradiation of laser beams.

27. A method of fabricating a single crystal thin film according to claim 25, wherein said first and second heat-treatments are performed by irradiation of laser beams, and an intensity of the laser beam at said second heat-treatment is lower than an intensity of the laser beam at said first heat-treatment.

28. A method of fabricating a single crystal thin film according to claim 25, wherein said second heat-treatment is performed at a temperature lower than a melting point of the polycrystalline thin film.

29. A method of fabricating a single crystal thin film according to claim 25, wherein at least either said first heat-treatment or said second heat-treatment is performed by irradiation of laser beams emitted from an excimer laser.

30. A method of fabricating a single crystal thin

film according to claim 25, wherein at least either said first heat-treatment or said second heat-treatment is performed by irradiation of line beam laser.

31. A method of fabricating a single crystal thin film according to claim 30, wherein said irradiation of line beam laser is performed by overlapping the laser beams in a scanning direction perpendicular to a longitudinal direction of the irradiation of line beam laser.

32. A method of fabricating a single crystal thin film according to claim 25, wherein at least either said first heat-treatment or said second heat-treatment is performed by irradiation of rectangular beam laser.

33. A method of fabricating a single crystal thin film according to claim 32, wherein said irradiation of rectangular beam laser is performed by using a mask.

34. A method of fabricating a single crystal thin film according to claim 25, wherein said second heat-treatment is furnace anneal, lamp anneal, or strip heater anneal.

35. A method of fabricating a single crystal thin film according to claim 25, wherein at least either said first heat-treatment or said second heat-treatment is performed substantially in a vacuum, an inert gas

atmosphere, or a non-oxidizing gas atmosphere.

36. A single crystal thin film substrate comprising:

an insulating base; and

a single crystal thin film formed on said insulating base by single-crystallization using laser irradiation.

37. A single crystal thin film substrate according to claim 36, wherein said single crystal thin film has a thickness of 500 nm or less.

38. A single crystal thin film substrate according to claim 36, wherein said insulating base is made from glass, quartz, or ceramic.

39. A single crystal thin film substrate according to claim 36, wherein said single crystal thin film is made from Si, SiGe or SiC.

40. A single crystal thin film substrate according to claim 36, wherein said single-crystallization for forming said single crystal thin film is performed by aligning polycrystalline grains in a polycrystalline thin film in an approximately regular pattern, and heat-treating said polycrystalline thin film.

41. A single crystal thin film substrate comprising:

an insulating base; and

a semiconductor thin film formed on said insulating base by crystallization using laser irradiation;

wherein said semiconductor thin film contains at least a single crystal region.

42. A single crystal thin film substrate according to claim 41, wherein said semiconductor thin film is a film in which said single crystal region is mixed with a polycrystalline semiconductor region and an amorphous semiconductor region.

43. A single crystal thin film substrate according to claim 41, wherein said semiconductor thin film has a thickness of 500 nm or less.

44. A single crystal thin film substrate according to claim 41, wherein said insulating base is made from glass, quartz, or ceramic.

45. A single crystal thin film substrate according to claim 41, wherein said semiconductor thin film is made from Si, SiGe or SiC.

46. A single crystal thin film substrate according to claim 41, wherein said single-crystallization for forming said semiconductor thin film is performed by aligning polycrystalline grains in a polycrystalline thin film in an approximately regular pattern, and heat-

treating said polycrystalline thin film.

47. A semiconductor device

an insulating base;

a semiconductor thin film formed on said insulating base, wherein at least part of said semiconductor thin film is formed by single-crystallization using laser irradiation; and

an insulating film formed on said single crystal thin film.

48. A semiconductor device according to claim 47, wherein said semiconductor thin film is a film in which a single crystal region is mixed with a polycrystalline semiconductor region and an amorphous semiconductor region.

49. A semiconductor device according to claim 47, wherein said semiconductor thin film has a thickness of 500 nm or less.

50. A semiconductor device according to claim 47, wherein said insulating base is made from glass, quartz, or ceramic.

51. A semiconductor device according to claim 47, wherein said semiconductor thin film is made from Si, SiGe or SiC.

52. A semiconductor device according to claim 47,

wherein said crystallization for forming said semiconductor thin film is performed by aligning polycrystalline grains in a polycrystalline thin film in an approximately regular pattern, and heat-treating said polycrystalline thin film.

53. A semiconductor thin film formed on an insulating base, comprising:

micro-projections formed on the surface of said semiconductor thin film.

54. A semiconductor thin film according to claim 53, wherein said micro-projections are arranged in an approximately regular pattern.

55. A semiconductor thin film according to claim 53, wherein a height of each of said micro-projections is in a range of 20 nm or less.

56. A semiconductor thin film according to claim 53, wherein a diameter of each of said micro-projections is in a range of 0.1 μm or less.

57. A semiconductor thin film according to claim 53, wherein a radius of curvature of each of said micro-projections is in a range of 60 nm or more.

58. A semiconductor thin film according to claim 53, wherein a density of said micro-projections is in a range of 1×10^{10} pieces/cm^2 or less.

59. A semiconductor thin film according to claim 53, wherein a thickness of said semiconductor thin film is in a range of 50 nm or less.

60. A semiconductor thin film according to claim 53, wherein said micro-projections are formed by uplift of boundary portions among polycrystalline grains in said semiconductor thin film.

61. A semiconductor thin film according to claim 53, wherein said semiconductor thin film is made of non-single crystals, single crystals, or a combination thereof.

62. A semiconductor thin film according to claim 53, wherein said semiconductor thin film contains a single crystal region having a size of 1×10^{-8} cm^2 or more.

63. A semiconductor thin film according to claim 53, wherein said semiconductor thin film contains a single crystal region having an orientation plane which is either of the (100), (111), and (110) planes.

64. A semiconductor device comprising:

an insulating base;

a semiconductor thin film formed on said insulating base; and

an insulating film formed on the surface of said

semiconductor thin film;

wherein micro-projections are formed on the surface of said semiconductor thin film.

65. A semiconductor device according to claim 64, wherein said micro-projections are arranged in an approximately regular pattern.

66. A semiconductor device according to claim 64, wherein a height of each of said micro-projections is in a range of 20 nm or less.

67. A semiconductor device according to claim 64, wherein a diameter of each of said micro-projections is in a range of 0.1 μm or less.

68. A semiconductor device according to claim 64, wherein a radius of curvature of each of said micro-projections is in a range of 60 nm or more.

69. A semiconductor device according to claim 64, wherein a density of said micro-projections is in a range of 1×10^{10} pieces/cm^2 or less.

70. A semiconductor device according to claim 64, wherein a thickness of said insulating film is in a range of 5 μm or less.

71. A semiconductor device according to claim 64, wherein a thickness of said semiconductor thin film is in a range of 50 nm or less.

72. A semiconductor device according to claim 64, wherein said semiconductor thin film is made of non-single crystals, single crystals, or a combination thereof.

73. A semiconductor device according to claim 64, wherein said semiconductor thin film contains a single crystal region having a size of 1×10^{-8} cm^2 or more.

74. A semiconductor device according to claim 64, wherein said semiconductor thin film contains a single crystal region having an orientation plane which is either of the (100), (111), and (110) planes.

75. A substrate comprising:

a semiconductor thin film having on its surface micro-projections.

76. A substrate according to claim 75, wherein said micro-projections are arranged in an approximately regular pattern.

77. A substrate according to claim 75, wherein a height of each of said micro-projections is in a range of 20 nm or less.

78. A substrate according to claim 75, wherein a diameter of each of said micro-projections is in a range of 0.1 μm or less.

79. A substrate according to claim 75, wherein a

radius of curvature of each of said micro-projections is in a range of 60 nm or more.

80. A substrate according to claim 75, wherein a density of said micro-projections is in a range of 1×10^{10} pieces/cm^2 or less.

81. A substrate according to claim 75, wherein a thickness of said semiconductor thin film is in a range of 50 nm or less.

82. A substrate according to claim 75, wherein said semiconductor thin film is made of non-single crystals, single crystals, or a combination thereof.

83. A substrate according to claim 75, wherein said semiconductor thin film contains a single crystal region having a size of 1×10^{-8} cm^2 or more.

84. A substrate according to claim 75, wherein said semiconductor thin film contains a single crystal region having an orientation plane which is either of the (100), (111), and (110) planes.

85. A method of fabricating a semiconductor thin film, comprising the steps of:

forming a non-single crystal thin film on an insulating base;

subjecting the non-single crystal thin film to a first heat-treatment, thereby forming a polycrystalline

thin film; and

subjecting the polycrystalline thin film to a second heat-treatment, thereby forming a crystallized semiconductor thin film;

wherein projections on the surface of the crystallized semiconductor thin film are lower than projections on the surface of the polycrystalline thin film.

86. A method of fabricating a semiconductor thin film according to claim 85, wherein said polycrystalline thin film has on its surface projections each having a height of 25 nm or more.

87. A method of fabricating a semiconductor thin film according to claim 85, wherein said crystallized semiconductor thin film has on its surface projections each having a height of 20 nm or less.

88. A method of fabricating a semiconductor thin film according to claim 85, wherein at least either said first heat-treatment and said second heat-treatment is performed by irradiation of laser beams.

89. A method of fabricating a semiconductor thin film according to claim 85, wherein said first and second heat-treatments are performed by irradiation of laser beams, and an intensity of the laser beam at said second

heat-treatment is lower than an intensity of the laser beam at said first heat-treatment.

90. A method of fabricating a semiconductor thin film according to claim 85, wherein said second heat-treatment is performed at a temperature lower than a melting point of the polycrystalline thin film.

91. A method of fabricating a semiconductor thin film according to claim 85, wherein at least either said first heat-treatment or said second heat-treatment is performed by irradiation of laser beams emitted from an excimer laser.

92. A method of fabricating a semiconductor thin film according to claim 85, wherein at least either said first heat-treatment or said second heat-treatment is performed by irradiation of line beam laser.

93. A method of fabricating a semiconductor thin film according to claim 92, wherein said irradiation of line beam laser is performed by overlapping the laser beams in a scanning direction perpendicular to a longitudinal direction of the irradiation of line beam laser.

94. A method of fabricating a semiconductor thin film according to claim 85, wherein at least either said first heat-treatment or said second heat-treatment is

performed by irradiation of rectangular beam laser.

95. A method of fabricating a semiconductor thin film according to claim 94, wherein said irradiation of rectangular beam laser is performed by using a mask.

96. A method of fabricating a semiconductor thin film according to claim 85, wherein said second heat-treatment is furnace anneal.

97. A method of fabricating a semiconductor thin film according to claim 85, wherein said second heat-treatment is lamp anneal.

98. A method of fabricating a semiconductor thin film according to claim 85, wherein at least either said first heat-treatment or said second heat-treatment is performed substantially in a vacuum, an inert gas atmosphere, or a non-oxidizing gas atmosphere.

99. A method of fabricating a semiconductor thin film, comprising the steps of:

forming a non-single crystal thin film on an insulating base;

subjecting the non-single crystal thin film to a first heat-treatment, thereby forming a polycrystalline thin film; and

subjecting the polycrystalline thin film to a second heat-treatment, thereby forming a crystallized

semiconductor thin film;

wherein a radius of curvature of each of projections on the surface of the crystallized semiconductor thin film is larger than a radius of curvature of each of projections on the surface of the polycrystalline thin film.

100. A method of fabricating a semiconductor thin film according to claim 99, wherein said polycrystalline thin film has on its surface projections each having a radius of curvature of 60 nm or less.

101. A method of fabricating a semiconductor thin film according to claim 99, wherein said crystallized semiconductor thin film has on its surface projections each having a radius of curvature of 60 nm or more.

102. A method of fabricating a semiconductor thin film according to claim 99, wherein at least either said first heat-treatment and said second heat-treatment is performed by irradiation of laser beams.

103. A method of fabricating a semiconductor thin film according to claim 99, wherein said first and second heat-treatments are performed by irradiation of laser beams, and an intensity of the laser beam at said second heat-treatment is lower than an intensity of the laser beam at said first heat-treatment.

104. A method of fabricating a semiconductor thin film according to claim 99, wherein said second heat-treatment is performed at a temperature lower than a melting point of the polycrystalline thin film.

105. A method of fabricating a semiconductor thin film according to claim 99, wherein at least either said first heat-treatment or said second heat-treatment is performed by irradiation of laser beams emitted from an excimer laser.

106. A method of fabricating a semiconductor thin film according to claim 99, wherein at least either said first heat-treatment or said second heat-treatment is performed by irradiation of line beam laser.

107. A method of fabricating a semiconductor thin film according to claim 106, wherein said irradiation of line beam laser is performed by overlapping the laser beams in a scanning direction perpendicular to a longitudinal direction of the irradiation of line beam laser.

108. A method of fabricating a semiconductor thin film according to claim 99, wherein at least either said first heat-treatment or said second heat-treatment is performed by irradiation of rectangular beam laser.

109. A method of fabricating a semiconductor thin

film according to claim 108, wherein said irradiation of rectangular beam laser is performed by using a mask.

110. A method of fabricating a semiconductor thin film according to claim 99, wherein said second heat-treatment is furnace anneal.

111. A method of fabricating a semiconductor thin film according to claim 99, wherein said second heat-treatment is lamp anneal.

112. A method of fabricating a semiconductor thin film according to claim 99, wherein at least either said first heat-treatment or said second heat-treatment is performed substantially in a vacuum, an inert gas atmosphere, or a non-oxidizing gas atmosphere.

113. A method of fabricating a semiconductor thin film, comprising the steps of:

forming a non-single crystal thin film on an insulating base;

subjecting the non-single crystal thin film to a first heat-treatment, thereby forming a polycrystalline thin film in which polycrystalline grains are aligned in an approximately regular pattern; and

subjecting the polycrystalline thin film to a second heat-treatment, thereby forming a semiconductor thin film in which micro-projections are each formed at a

boundary position among at least three or more of the polycrystalline grains;

wherein a height of each of the micro-projections is in a range of 25 nm or less or a radius of curvature of each of the micro-projections is in a range of 60 nm or more.

114. A method of fabricating a semiconductor thin film according to claim 113, wherein at least either said first heat-treatment and said second heat-treatment is performed by irradiation of laser beams.

115. A method of fabricating a semiconductor thin film according to claim 113, wherein said first and second heat-treatments are performed by irradiation of laser beams, and an intensity of the laser beam at said second heat-treatment is lower than an intensity of the laser beam at said first heat-treatment.

116. A method of fabricating a semiconductor thin film according to claim 113, wherein said second heat-treatment is performed at a temperature lower than a melting point of the polycrystalline thin film.

117. A method of fabricating a semiconductor thin film according to claim 113, wherein at least either said first heat-treatment or said second heat-treatment is performed by irradiation of laser beams emitted from an

excimer laser.

118. A method of fabricating a semiconductor thin film according to claim 113, wherein at least either said first heat-treatment or said second heat-treatment is performed by irradiation of line beam laser.

119. A method of fabricating a semiconductor thin film according to claim 118, wherein said irradiation of line beam laser is performed by overlapping the laser beams in a scanning direction perpendicular to a longitudinal direction of the irradiation of line beam laser.

120. A method of fabricating a semiconductor thin film according to claim 113, wherein at least either said first heat-treatment or said second heat-treatment is performed by irradiation of rectangular beam laser.

121. A method of fabricating a semiconductor thin film according to claim 120, wherein said irradiation of rectangular beam laser is performed by using a mask.

122. A method of fabricating a semiconductor thin film according to claim 113, wherein said second heat-treatment is furnace anneal.

123. A method of fabricating a semiconductor thin film according to claim 113, wherein said second heat-treatment is lamp anneal.

124. A method of fabricating a semiconductor thin film according to claim 113, wherein at least either said first heat-treatment or said second heat-treatment is performed substantially in a vacuum, an inert gas atmosphere, or a non-oxidizing gas atmosphere.

125. A method of fabricating a semiconductor thin film according to claim 113, wherein a size of each of the polycrystalline grains is in a range of 0.1 μm to 4.0 μm.

126. A semiconductor thin film comprising:

an insulating base; and

a polycrystalline thin film formed in said insulating base, in which polycrystalline grains are aligned in an approximately regular pattern;

wherein micro-projections are each formed at a boundary position among at least three or more of said polycrystalline grains.

127. A semiconductor thin film according to claim 126, wherein said micro-projections are aligned in an approximately regular pattern.

128. A semiconductor thin film according to claim 126, wherein a thickness of said semiconductor thin film is in a range of 50 nm or less.

129. A semiconductor thin film according to claim

126, wherein a size of each of said polycrystalline grains is in a range of 0.1 μm to 4.0 μm.

130. A method of fabricating a semiconductor thin film on a base, comprising the steps of:

forming a hydrogen containing non-single crystal semiconductor thin film;

subjecting the hydrogen containing non-single crystal thin film to a first heat-treatment, thereby removing hydrogen therefrom;

continuously subjecting the non-single crystal thin film from which hydrogen has been removed to a second heat-treatment, thereby forming a polycrystalline film in which polycrystalline grains are aligned in an approximately regular pattern.

131. A method of fabricating a semiconductor thin film according to claim 130, wherein the polycrystalline grains aligned in an approximately regular pattern are grown in sold-phase by said second heat-treatment, to reduce boundaries among the polycrystalline grains.

132. A method of fabricating a semiconductor thin film according to claim 130, wherein said first and second heat-treatments are performed by irradiation of laser beams.

133. A method of fabricating a semiconductor thin

film according to claim 130, wherein said first heat-treatment is performed by irradiation of rectangular beam laser.

134. A method of fabricating a semiconductor thin film according to claim 130, wherein said first heat-treatment is performed by irradiation of laser beams emitted from an excimer laser, and a pulse width of the laser beams is in a range of 60 ns or more.

135. A method of fabricating a semiconductor thin film according to claim 130, wherein said second heat-treatment is performed by irradiation of line beam laser.

136. A method of fabricating a semiconductor thin film according to claim 130, wherein said first and second heat-treatments are performed in the same chamber.

137. A method of fabricating a semiconductor thin film on a base, comprising the steps of:

forming a hydrogen containing non-single crystal semiconductor thin film;

subjecting the hydrogen containing non-single crystal thin film to a first heat-treatment, thereby removing hydrogen therefrom;

continuously subjecting the non-single crystal thin film from which hydrogen has been removed to a second heat-treatment, thereby melting and recrystallizing the

non-single crystal thin film; and

subjecting a polycrystalline film formed by melting and recrystallization to a third heat-treatment, thereby converting the polycrystalline film into a single crystal film.

138. A method of fabricating a semiconductor thin film according to claim 137, wherein in said step of melting and recrystallizing the non-single crystal thin film by said second heat-treatment, the non-single crystal thin film is converted into a polycrystalline film in which polycrystalline grains are aligned in an approximately regular pattern.

139. A method of fabricating a semiconductor thin film according to claim 137, wherein said first, second and third heat-treatments are performed by irradiation of laser beams.

140. A method of fabricating a semiconductor thin film according to claim 137, wherein said first heat-treatment is performed by rectangular beam laser.

141. A method of fabricating a semiconductor thin film according to claim 137, wherein said first heat-treatment is performed by irradiation of laser beams emitted from an excimer laser, and a pulse width of the laser beams is in a range of 60 ns or more.

142. A method of fabricating a semiconductor thin film according to claim 137, wherein said second heat-treatment is performed by irradiation of line beam laser.

143. A method of fabricating a semiconductor thin film according to claim 137, wherein said first, second and third heat-treatments are performed in the same chamber.

144. A method of fabricating a semiconductor thin film according to claim 137, wherein an integral irradiation energy amount at said third heat-treatment is lower than that at said second heat-treatment.

145. A method of fabricating a semiconductor thin film according to claim 137, wherein a heat-treatment temperature of said third heat-treatment is lower than that of said second heat-treatment.

146. A method of fabricating a semiconductor thin film according to claim 137, wherein a heat-treatment temperature of said third heat-treatment is equal to or less than a melting point of the polycrystalline film.

147. A method of fabricating a semiconductor thin film according to claim 137, wherein said second heat-treatment is performed by irradiation of rectangular beam laser using a mask.

148. A method of fabricating a semiconductor thin

film according to claim 137, wherein said third heat-treatment is furnace anneal.

149. A method of fabricating a semiconductor thin film according to claim 137, wherein said third heat-treatment is lamp anneal.

150. A method of fabricating a semiconductor thin film according to claim 137, wherein at least either of said first, second and third heat-treatments is performed substantially in a vacuum, an inert gas atmosphere, or a non-oxidizing gas atmosphere.

151. A method of fabricating a semiconductor thin film according to claim 137, wherein said first, second and third heat-treatments are continuously performed in an air-tight atmosphere.

152. A method of fabricating a semiconductor thin film according to claim 137, wherein a size of each of the polycrystalline grains in the polycrystalline thin film is in a range of 0.2 μm to 0.6 μm.

153. A method of fabricating a semiconductor thin film according to claim 137, wherein said first and third heat-treatments are performed by using the same laser system.

154. An apparatus for fabricating a single crystal semiconductor thin film on a base, comprising:

thin film forming means for forming a hydrogen containing non-single crystal thin film on the base;

first heat-treatment means for subjecting the hydrogen containing non-single crystal thin film to a first heat-treatment, thereby removing hydrogen therefrom; and

second heat-treatment means for continuously subjecting the non-single crystal thin film from which hydrogen has been removed to a second heat-treatment, thereby melting and recrystallizing the non-single crystal thin film.

155. An apparatus for fabricating a single crystal semiconductor thin film according to claim 154, wherein the non-single crystal thin film is converted into a polycrystalline film in which polycrystalline grains are aligned in an approximately regular pattern by said second heat-treatment for melting and recrystallizing the non-single crystal thin film.

156. An apparatus for fabricating a single crystal semiconductor thin film according to claim 154, wherein said first and second heat-treatment means are irradiation of laser beams.

157. An apparatus for fabricating a single crystal semiconductor thin film according to claim 154, wherein

said first heat-treatment means is irradiation of rectangular beam laser.

158. An apparatus for fabricating a single crystal semiconductor thin film according to claim 154, wherein said first heat-treatment means is irradiation of laser beams emitted from an excimer laser, and a pulse width of the laser beams is in a range of 60 ns or more.

159. An apparatus for fabricating a single crystal semiconductor thin film according to claim 154, wherein said second heat-treatment means is irradiation of line beam laser.

160. An apparatus for fabricating a single crystal semiconductor thin film according to claim 154, wherein said first and second heat-treatment means are disposed in the same chamber.

161. An apparatus for fabricating a single crystal semiconductor thin film according to claim 154, wherein said second heat-treatment means is irradiation of rectangular beam laser using a mask.

162. An apparatus for fabricating a single crystal semiconductor thin film according to claim 154, wherein at least either of said first and second heat-treatment means is kept substantially in a vacuum, an inert gas atmosphere, or a non-oxidizing gas atmosphere.

163. An apparatus for fabricating a single crystal semiconductor thin film according to claim 154, wherein said first and second heat-treatment means are continuously disposed.

164. An apparatus for fabricating a single crystal semiconductor thin film according to claim 154, wherein said first and second heat-treatment means are continuously, air-tightly disposed.

165. An apparatus for fabricating a single crystal semiconductor thin film on a base, comprising:

thin film forming means for forming a hydrogen containing non-single crystal thin film on the base;

first heat-treatment means for subjecting the hydrogen containing non-single crystal thin film to a first heat-treatment, thereby removing hydrogen therefrom; and

second heat-treatment means for continuously subjecting the non-single crystal thin film from which hydrogen has been removed to a second heat-treatment, thereby forming a polycrystalline film; and

third heat-treatment means for subjecting the polycrystalline film to a third heat-treatment, thereby converting the polycrystalline film into a single crystal film.

166. An apparatus for fabricating a single crystal semiconductor thin film according to claim 165, wherein the non-single crystal thin film is converted into a polycrystalline film in which polycrystalline grains are aligned in an approximately regular pattern by said second heat-treatment for melting and recrystallizing the non-single crystal thin film.

167. An apparatus for fabricating a single crystal semiconductor thin film according to claim 165, wherein said first, second and third heat-treatment means are irradiation of laser beams.

168. An apparatus for fabricating a single crystal semiconductor thin film according to claim 165, wherein said first heat-treatment means is irradiation of rectangular beam laser.

169. An apparatus for fabricating a single crystal semiconductor thin film according to claim 165, wherein said first heat-treatment means is irradiation of laser beams emitted from an excimer laser, and a pulse width of the laser beams is in a range of 60 ns or more.

170. An apparatus for fabricating a single crystal semiconductor thin film according to claim 165, wherein said second heat-treatment means is irradiation of line beam laser.

171. An apparatus for fabricating a single crystal semiconductor thin film according to claim 165, wherein said first, second and third heat-treatment means are disposed in the same chamber.

172. An apparatus for fabricating a single crystal semiconductor thin film according to claim 165, wherein an integral irradiation energy amount at said third heat-treatment is larger than that at said second heat-treatment.

173. An apparatus for fabricating a single crystal semiconductor thin film according to claim 165, wherein a heat-treatment temperature of said third heat-treatment is lower than that of said second heat-treatment.

174. An apparatus for fabricating a single crystal semiconductor thin film according to claim 165, wherein a heat-treatment temperature of said third heat-treatment is equal to or less than a melting point of the polycrystalline film.

175. An apparatus for fabricating a single crystal semiconductor thin film according to claim 165, wherein said second heat-treatment means is a system for irradiation of rectangular beam laser using a mask.

176. An apparatus for fabricating a single crystal semiconductor thin film according to claim 165, wherein

said third heat-treatment means is a resistance heating furnace.

177. An apparatus for fabricating a single crystal semiconductor thin film according to claim 165, wherein said third heat-treatment means is an infrared ray lamp, a xenon lamp, or a krypton lamp.

178. An apparatus for fabricating a single crystal semiconductor thin film according to claim 165, wherein at least either of said first, second and third heat-treatment means is kept substantially in a vacuum, an inert gas atmosphere, or a non-oxidizing gas atmosphere.

179. An apparatus for fabricating a single crystal semiconductor thin film according to claim 165, wherein said first and second heat-treatment means are the same laser system.

180. An apparatus for fabricating a single crystal semiconductor thin film according to claim 165, wherein said first, second and third heat-treatment means are continuously disposed.

181. An apparatus for fabricating a single crystal semiconductor thin film according to claim 180, wherein said first, second and third heat-treatment means are air-tightly disposed.